A biomarker of collagen type I degradation is associated with cardiovascular events and mortality in patients with atherosclerosis

**Objective**
Atherosclerosis is characterized by accumulation of lipids, cells and extracellular matrix (ECM) proteins in the arterial wall. Collagen type I (COL1), a component of the arterial ECM, is cleaved by matrix metalloproteinases (MMPs) and known to be remodelled in atherosclerosis. We explored whether the MMP-mediated COL1 biomarker, C1M, was associated with cardiovascular events, cardiovascular mortality and all-cause mortality in a large prospective cohort of patients with known atherosclerosis.

**Methods**
Serum from 787 patients who underwent a carotid endarterectomy was included. Circulating levels of C1M were measured in serum. A total of 473 patients were followed for 6 years after surgery. Associations between C1M and incidence of cardiovascular events, cardiovascular mortality and all-cause mortality were assessed by Kaplan-Meier curves and Cox regression analysis.

**Results**
A total of 101 (21.4%) patients suffered from nonfatal cardiovascular events during the follow-up period, and 64 (13.5%) patients died. Of these, 39 (60.9%) died from cardiovascular diseases. Patients with C1M levels above the median were significantly associated with cardiovascular events, cardiovascular mortality and all-cause mortality ($P < 0.001$, $P = 0.004$ and $P < 0.001$, respectively). C1M was included in the final model for prediction of cardiovascular events (HR 2.15, 95% CI 1.40-3.32, $P = 0.001$), cardiovascular mortality (HR 2.20, 95% CI 1.07-4.51, $P = 0.031$) and all-cause mortality (HR 2.98 95% CI 1.67-5.33, $P < 0.001$).

**Conclusions**
In patients with atherosclerotic carotid lesions, high levels of C1M predicted cardiovascular events, cardiovascular mortality and all-cause mortality. These findings emphasize the importance of remodelling mechanisms in atherosclerosis that are now becoming more and more explored.